pointic contact with any plane curve; but his method does not appear to admit of direct extension to curves of higher orders than conics having contact with any plane curve. The method here suggested would admit of such extension; and it may therefore be said to contain potentially the solution of the general problem of contact. But the labour of completely working out even the case of a cubic of nine-pointic contact would be very great. The case of the conic of five-pointic contact has been worked out, and the result agrees with Mr. Cayley's.

XIII. "On the Calculus of Functions." By WILLIAM SPOTTISWOODE, Esq., M.A., F.R.S. Received October 9, 1861.

(Abstract.)

In a paper published in the 'Philosophical Transactions' for 1861, p. 69, Mr. W. H. L. Russell has constructed systems of multiplication and division for functions of certain non-commutative symbols, viz. $\rho=x$, and $\pi=x\dfrac{d}{dx}$, and has given the quotient and remainder after both "internal" and "external division" of the symbolical function

$$\rho^n\phi_n(\pi)+\rho^{n-1}\phi_{n-1}(\pi)+\ \ldots\ \phi_0(\pi)$$

by the factor $\rho\psi_1(\pi)+\psi_0(\pi)$. But in the case of

$$\phi_n(\rho)\pi^n+\phi_{n-1}(\rho)\pi^{n-1}+\ \ldots\ \phi_0(\rho)$$

he has given only the quotient and remainder after internal division in the case of $n=3$. I have here investigated the general case. The formulæ will be best understood by reference to the memoir itself.

XIV. "On the Action of Hydriodic Acid upon Mannite." By J. A. WANKLYN, Esq., and Dr. ERLENMEYER. Communicated by Dr. FRANKLAND. Received October 24, 1861.

Mannite may be regarded as a six-atomic alcohol, or better as *hydride of hexyl*, in which six atoms of hydrogen are replaced by six atoms of peroxide of hydrogen.

$$\text{Mannite}=\mathrm{C_6\,H_8\,(H\Theta)_6}.$$

This formula is established by the reaction between mannite and hydriodic acid. When the two bodies are heated together iodine is evolved, and a heavy oily liquid distils. This liquid is *iodide* of *hexyl*. By using a sufficient excess of hydriodic acid—8 grms. of mannite to 100 cubic centimetres of strong acid boiling at 125° C. —and by transmitting carbonic acid through the hot liquid, so as to remove the oily product as rapidly as possible from contact with hot iodine, a quantity of iodide of hexyl, approximating closely to that required by the following equation, may be obtained:—

$$\overbrace{C_6 H_8 (HO)_6}^{\text{Mannite.}} + 11HI = \overbrace{C_6 H_{13} I}^{\text{Iodide of Hexyl.}} + 6H_2O + I_{10}.$$

From 96 grms. of mannite we have obtained 83 grms. of very nearly pure *iodide* of *hexyl*.

The equation requires 182 grms. mannite to 212 grms. iodide of hexyl.

The identity of our product with iodide of hexyl was shown by its analysis, and by the following reactions:—

Digested with water and oxide of silver, it yields an oily liquid lighter than water, differing completely in smell from amylic alcohol, and having the composition of *hexylic alcohol*. Its analysis gave carbon 70·21 per cent., and hydrogen 13·84.

The calculated numbers for hexylic alcohol are—

Carbon	70·59,
Hydrogen ..	13·73,

which agree completely with our result.

When caustic potash and common alcohol are employed instead of oxide of silver with water, a different result occurs; the iodide splits up into hexylene and hydriodic acid, which latter reacts upon the potash.

Hexylene prepared by this process is an oily liquid, lighter than water, of very penetrating odour, and boiling at about 68° C. Its constitution was proved on the one hand by its analysis and vapour-density, and on the other by its deportment with bromine, upon which it reacts with extreme violence, combining without evolution of HBr, and yielding a heavy liquid, whose composition, ascertained by analysis, is $C_6 H_{12} Br_2$.

We defer the further description of our compounds, as it is our

intention to make an extended investigation of the bodies belonging to the hexyl group, which are very imperfectly known, as may be inferred from the fact that Faget, the discoverer of hexylic alcohol, has not even published its analysis.

XV. "The Lignites and Clays of Bovey Tracey, Devonshire." By William Pengelly, Esq., F.G.S. Communicated by Sir Charles Lyell. Received November 16, 1861.

(Abstract.)

The village of Bovey Tracey, in Devonshire, is situated on the left bank of the river Bovey, a small tributary of the Teign, about eleven miles south-westerly from Exeter. A considerable plain stretches away from it, for about nine miles, in a south-easterly direction, and terminates three and a half miles north-west of Torquay. It appears a lake-like expansion of the valleys of the Bovey and Teign, and is surrounded on all sides by lofty hills of granite and other rocks.

Excavations in various parts of this plain, especially in the north-western part of it, known as Bovey Heathfield, have disclosed, beneath an accumulation of gravel mixed with clay and sand, a regular series of strata of lignite, clay and sand, well known to geologists as the "Bovey deposit," whilst the lignite is equally familiar as "Bovey coal."

The most important of the excavations is that known as the "Coal-pit," whence lignite is extracted, which is used, in small quantities, at a neighbouring pottery, and also by the poorer cottagers of the immediate neighbourhood.

The deposit has long attracted the attention of both the scientific and commercial world, and many authors have given descriptions and speculations respecting it.

In 1760 the Rev. Dr. Jeremiah Milles sent a paper on it to the Royal Society. His aim appears to have been to prove the *mineral* origin of the lignite, in refutation of Professor Hollman, of Göttingen, who had described, and assigned a vegetable origin to, a similar substance found near the city of Munden. In 1794 and 1796 Dr. Maton described the deposit, and mentioned the existence of a large turf bog, near the pit, in which whole trees were often discovered,